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AUTHOR Goor, Jeanette; And Others
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ABSTRACT

This report presents findings from a national survey conducted through the National Center for Education Statistics' (NCES) Fast Response Survey System (FRSS) on the availability of interactive computers for instructional purposes in public elementary and secondary schools. Following an introduction which outlines the background of and rationale for the survey, findings are presented on nine major topics: (1) the number and location of computers available for student use, (2) the uses of computers in instruction. (3) the uses of computers in relation to school district characteristics, (4) computer uses per school district, (5) the number of school districts employing computers in instruction, (6) student access to computers, (7) the number of schools with computers, (8) methods for improving computer-based instruction, and (9) critical needs for the initiation of computer-based instruction programs by school districts. Five data tables, four charts, an appendix describing the Fast Response Survey System, and a copy of the survey questionnaire accompany the text. (Author/JL)

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Student Use of Computers in Schools Fall 1980

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FRSS Report No. 12

HIGHLIGHTS

- An estimated total of about 52,000 computers were available for instructional use in the Nation's public school system in fall 1980. Two-fifths of these were terminals with access to remote computers, and three-fifths were microcomputers.

- Almost one-half (48 percent) of the Nation's school districts, enrolling about 78 percent of all public school students, provided students with access to computers for instructional purposes. In addition, 18 percent of the districts without this instructional resource planned to acquire it within 3 years.

- About one-fourth (26 percent) of all public schools had one or more computers for instructional use.

- Computers were concentrated in secondary schools. Almost three-fourths of all microcomputers and terminals were located in secondary-level schools, and one-half of all secondary schools provided students with access to computers of some kind.

- Instruction in computer literacy was the most prevalent educational use, reported by 85 percent of the districts with computers. Other uses were learning enrichment (72 percent of the districts), challenge use for high achievers (64 percent), and remedial and compensatory education (45 percent).

- Two means of improving computer-based instruction were used or planned by about 70 percent of the districts providing computer access or planning such access: in-service teacher training and establishment of a group to select computer programs and material.

- In-service teacher training was viewed as critical to the initiation or expansion of computer-based instruction by 47 percent of all districts. Other critical needs included a greater range of instructional computer programs (41 percent), assistance in planning a computer-based instruction program (35 percent), and technical assistance to support program operations (29 percent).

Note.--In this study, computers were defined as interactive computer units--microcomputers or terminals connected to central processors--used by students for instructional purposes.

Student Use of Computers in Schools Fall 1980

A Survey of Public School Districts

FRSS Report No. 12

by
Jeanette Goor
National Center for
Education Statistics

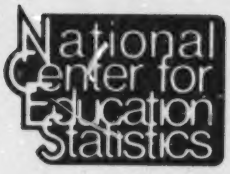
Arthur Melmed
National Institute of Education

Elizabeth Farris
Westat

U.S. Department of Education
T. H. Bell
Secretary

Office of Educational Research and Improvement
Donald J. Senese
Assistant Secretary

National Center for Education Statistics
Marie D. Eldridge
Administrator



National Center for Education Statistics

"The purpose of the Center shall be to collect and disseminate statistics and other data related to education in the United States and in other nations. The Center shall . . . collect, collate, and, from time to time, report full and complete statistics on the conditions of education in the United States; conduct and publish reports on specialized analyses of the meaning and significance of such statistics; . . . and review and report on education activities in foreign countries."--Section 406(b) of the General Education Provisions Act, as amended (20 U.S.C. 1221e-1).

Other reports of the Fast Response Survey System (FRSS):

No. 1 -- Statewide Developments in Performance-Based Education, 1976; a Survey of State Education Agencies

No. 2 -- Job Placement Services Provided by Local School Systems to High School Students, Graduates, and Dropouts, 1976

No. 3 -- Part-Time Financial Aid Counselors in Institutions of Higher Education, 1977

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No. 11-- Trends in Vocational Education in the Arts, 1980 (Forthcoming)

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FOREWORD

Recent advances in educational technology have enabled schools to purchase relatively inexpensive microcomputers. These compact but powerful computers expand the opportunities for computer-based education, formerly available only through terminals connected to central computers.

This report presents findings of a national survey conducted by the National Center for Education Statistics (NCES) on the availability of interactive computers for instructional purposes and their use by students. The survey was conducted through NCES's Fast Response Survey System (FRSS), established to quickly collect issue-oriented data on emerging educational developments.

It is hoped that this report, the twelfth in the FRSS series, will be useful to public education authorities, as well as to concerned individuals and organizations in the private sector.

Marie D. Eldridge

Marie D. Eldridge
Administrator

ACKNOWLEDGEMENTS

This survey was conducted for the Assistant Secretary for Educational Research and Improvement, U.S. Department of Education, in support of the Secretary's technology initiative. Arthur Melmed, Advisor to the Assistant Secretary, developed the conceptual framework, defined the data needs, and advised on various phases of the survey.

As subject matter consultant, Catherine Morgan brought to the development of the questionnaire extensive knowledge of districts' experiences with computers. While employed by the Montgomery County (Maryland) Public Schools, she served as director of the Division of Computer-Related Instruction and of the Instructional Systems Development Project.

The survey was supported by the Council of Chief State School Officers (CCSSO) through its Committee for Evaluation and Information Systems (CEIS). Chaired by Bertha McCloskey (Missouri) and including Ed Allen (Florida) and George Rush (CCSSO), the CEIS Fast Response Panel made valuable suggestions to strengthen data collection.

The prompt and thoughtful responses of the school districts in the FRSS sample provided an excellent data base for national estimates. Their cooperation continues to be essential to the success of FRSS.

The survey, conducted by NCES's FRSS contractor, Westat, a research firm in Rockville, Maryland, was performed under the leadership of Elizabeth Farris. The Westat project team included John Barton, Debra Cesare, Jo Anne Schneider, and Margaret Mechling.

A number of NCES staff members participated in the survey and contributed to this report. Under the general direction of David Sweet, Assistant Administrator for Multilevel Education Statistics, Jeanette Goor was responsible for the survey from inception to report. Ronald Pedone, who represented NCES on the Task Force, was instrumental in the initiation of the survey. Douglas Wright advised on analysis. Philip Carr designed the cover and title pages.

The authors express their sincere appreciation for the assistance provided by these and other individuals who contributed to a successful survey.

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INTRODUCTION

The use of interactive computers for instructional purposes has increased considerably since the late 1970's with advancing electronic technology. Computer-based education has been available to students since the mid-sixties through terminals connected to central processing units. Current developments in microminiaturization that result in sharply declining costs are expected to have a dramatic effect on increasing school use.

In 1972, microprocessors (or "miracle chips") became widely available. Embedded on these flat chips, only about one-fourth of an inch square, are Large Scale Integrated (LSI) circuits that are equivalent to about 50,000 or more transistors. 1/ Microprocessors have the computing capacity of the central processing units of the computers of 25 years ago. At first, enthusiastic computer hobbyists used these versatile and powerful microprocessors to assemble "personal computers." In 1977, however, microcomputers were introduced commercially. Aggressive marketing and the instructional potential of the sophisticated, relatively low-priced microcomputers encouraged schools to acquire them.

Today's microcomputer usually comprises a typewriter-like keyboard, a TV-like screen, logic and internal memory, and at least one input-output device for storage and retrieval of programs and data. Like terminals, the self-contained microcomputers provide interactive capability, that is, immediate machine response to direct user contact.

The growing presence of interactive computers in the schools has created a need for planning information about the extent and nature of their use for instructional purposes. At the request of the Assistant Secretary for Educational Research and Improvement, the National Center for Education Statistics conducted a survey of school districts to obtain the following information in support of the Secretary's technology initiative:

- Availability to students of interactive computers for instructional purposes: number of terminals and microcomputers; number of districts and schools providing such access
- Instructional uses of these computers
- Methods to facilitate or improve computer instruction
- Needs considered critical to the expansion or initiation of an education program involving student use of interactive computers.

School districts were requested to report only those computers that were used interactively by students for instructional purposes. Excluded from the scope of the survey, therefore, were computers used by districts for administrative tasks, vocational data processing courses, and computer-managed instruction that did not entail interactive use by students.

The reader is cautioned that, as with all surveys based on samples, the findings are subject to sampling errors that usually are larger for estimates of small quantities. The methodology of the survey is described in appendix I, and the survey questionnaire is presented in appendix II.

1/ Longsdon, Tom, Computers and Social Controversy, Chapter 1, Computer Science Press, Inc., 1980.

SURVEY FINDINGS

Number and Location of Computers Available for Instructional Use 1/

According to school district estimates, a total of 52,251 computers were available to students for instructional use in fall 1980 (table 1). In the few years they have been on the market, microcomputers have come to outnumber the more traditional terminals. About three-fifths (59 percent) of the available computers were microcomputers, and two-fifths (41 percent) were terminals.

Almost three-fourths (73 percent) of all computers were located in secondary schools. One-fourth (24 percent) were available at the elementary level and 5 percent at the combined and special level. 2/ The distribution pattern of microcomputers was similar to that of terminals across all levels of instruction.

The distribution of microcomputers showed little variation by district enrollment size. About one-third of the microcomputers were located in each of the three district size classes--small (fewer than 2,500 students), medium (between 2,500 and 9,999 students), and large (10,000 or more students). Terminals, however, tended to be concentrated in the medium-sized and large districts (38 and 44 percent, respectively) rather than in small districts (18 percent).

Over two-thirds of the computers were located in districts in two geographic regions--the Great Lakes and Plains (32 percent) and the West and Southwest (37 percent). Only 10 percent were available in districts in the Southeast. The regional distribution of microcomputers was similar to that of terminals.

1/ The term "computers" refers to interactive computer units--microcomputers or terminals connected to central processors--used by students for instructional purposes.

2/ School districts reported computer access by type of school according to their own classification of elementary, secondary, and combined elementary and secondary or special types, such as special education or vocational education schools. This approach to collecting data by level of instruction was necessitated by the great diversity of organizational structures among school districts.

Table 1.--Number of computers available for student use, by type of computer, instructional level, and selected district characteristics: United States, fall 1980

Instructional level and district characteristics	All computers		Microcomputers		Terminals	
	Number	Percent	Number	Percent	Number	Percent
Total.....	52,251	100	30,715	59	21,536	41
	(Percents below are based on the column totals)					
Total.....	52,251	100	30,715	100	21,536	100
Instructional level: 1/						
Elementary.....	12,365	24	6,944	23	5,421	25
Secondary.....	38,145	73	23,173	75	14,972	70
Combined and special 2/..	2,845	5	1,404	5	1,441	7
Enrollment size:						
Fewer than 2,500.....	14,504	28	10,648	35	3,856	18
2,500-9,999.....	18,387	35	10,228	33	8,159	38
10,000 or more.....	19,361	37	9,840	32	9,521	44
Region:						
North Atlantic.....	11,530	22	5,960	19	5,570	26
Great Lakes and Plains...	16,574	32	9,713	32	6,861	32
Southeast.....	5,052	10	3,115	10	1,937	9
West and Southwest.....	19,094	37	11,927	39	7,167	33

1/ Numbers for instructional level do not sum to totals and percents do not sum to 100 because some computers were shared across levels.
2/ Schools that contained both elementary and secondary grades, or special types, such as special or vocational education.

Note.--Numbers may not sum to totals because of weighting; percents may not sum to 100 because of rounding.

Uses of Computers for Instruction

Interactive computers were used for one or more of the following educational purposes:

- Computer literacy instruction, i.e., introduction to computer concepts
- Remedial and compensatory education, e.g., drill and practice
- Learning enrichment in specific subject areas
- Challenge use for high achievers, e.g., computer clubs, special classes.

Districts with computers indicated the purposes for which computers were employed and rank ordered the relative proportion of use. In addition, alternate ranks were assigned if districts planned or preferred to change the proportion of usage.

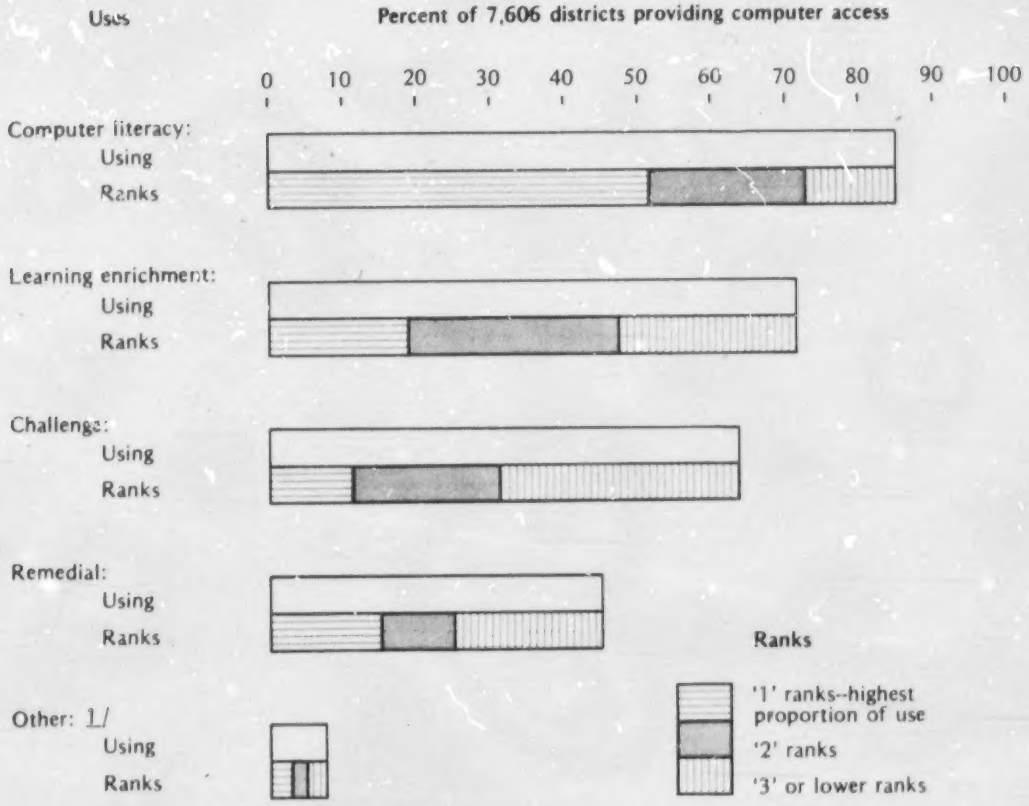
Instruction in computer literacy was the most prevalent of the four listed educational uses. An estimated 85 percent of the 7,606 districts with computers used them to help students understand computer concepts (chart 1). An estimated 61 percent of these districts (or about 52 percent of all districts with computers) ranked computer literacy as the primary instructional application of computers.

Computer-based learning enrichment and challenge uses also were widespread; these instructional applications were offered by 72 and 64 percent of the districts, respectively. However, only small proportions of the districts considered either of these uses as primary. About one-fourth of the districts providing learning enrichment ranked this as the principal instructional use of computers, as did 17 percent of the districts utilizing computers to challenge high achievers.

The least extensive use of computers was for remedial and compensatory education. Fewer than one-half (45 percent) of the districts utilized computers for this purpose, with one-third of these districts ranking it as primary. "Other" applications, such as programming and career guidance, were reported by 8 percent of the districts.

Districts with computers generally were satisfied with the current apportionment of computer time among the educational uses. Only small percents of districts with computers planned or preferred to change the priority of computer usage. Some districts indicated possible initiation of computer instruction in areas not offered currently. The proportion of these districts ranged from 16 percent that did not teach computer literacy to 10 percent that did not provide computer-based learning enrichment. Similar percents of districts already employing computers for the specified purposes preferred to change the proportion of computer time allotted for these uses--from 12 percent of the districts offering remedial and compensatory education to 7 percent of those using computers to challenge high achievers. Generally, priority changes were balanced between increasing and decreasing usage.

Chart 1.--Instructional uses of computers and ranks of the proportion of each use: United States, fall 1980



1/ Such as computer programming, career guidance, and college information.

Use of Computers, by Type of Access and District Characteristics

Computer usage was related to type of computer access and to selected school district characteristics (table 2). Districts that had both microcomputers and terminals tended to make greater use of computers than did those that had microcomputers only. For example, the percents of districts having both types of computers and using them for each of the specified purposes ranged from 68 percent for remedial education to 94 percent for computer literacy. Corresponding percentages for districts with microcomputers only were 33 to 82 percent. In addition, proportionally more districts with both microcomputers and terminals provided computer literacy and computer-based learning enrichment than did districts with terminals only.

Variations in usage occurred by instructional level as well. Since the instructional level data contain duplicate counts, however, computer usage is difficult to attribute to any single level. In the elementary level category, for example, only a small portion of the districts provided computer instruction at the elementary level only; most provided computer access at the secondary as well as the elementary level. On the other hand, secondary level data contain less overlap; about 70 percent of the districts with computer access in secondary schools provided such service only at the secondary level. Districts providing access at the secondary level tended to use computers less frequently for remedial purposes than for other instructional purposes.

Computer usage in all instructional categories appeared to increase as the district enrollment size increased. However, the difference was statistically significant only for remedial and compensatory education in small and large districts. Almost three-fifths (57 percent) of the large districts that had computers used them for remedial work, compared with two-fifths (42 percent) of the small districts.

Although the instructional uses of computers within each geographic region generally followed the national pattern, some differences among regions emerged. For example, about one-half of the North Atlantic districts with access utilized computers for remedial and compensatory education, but only one-fifth of the Southeast districts did so. Similarly, 91 percent of the districts in the North Atlantic provided instruction in computer literacy, compared with 73 percent of the districts in the Southeast.

Across many categories of district characteristics, computers were used least often for remedial instruction. This relative infrequency of use may stem from several factors. Computers were concentrated in schools at the secondary level, and secondary schools gave less emphasis to remedial and compensatory instruction than did lower grades. For example, 63 percent of the districts with computers made them available only to secondary students, and only one-third of these districts provided computer-based remedial instruction. In addition, computer usage is dependent on the availability of appropriate programs or software. Reportedly, software products for remedial and compensatory instruction were not widely available for use with microcomputers at the time of the survey. Since the majority (61 percent) of districts with computers had microcomputers only, the lack of remedial instruction programs for microcomputers would have an impact on the overall use of computers for this purpose.

Table 2.--Instructional uses of computers, by type of computer access and selected district characteristics: United States, fall 1980

Type of computer access and district characteristics	Number of districts with computers	Uses			
		Computer literacy	Learning enrichment	Challenge use	Remedial
Total	7,606	6,434	5,509	4,843	3,397
		(In percents of column 1)			
Total	7,606	85	72	64	45
Type of access--computers:					
Micros only	4,634	82	66	61	33
Terminals only	976	77	71	56	49
Micros and terminals	1,996	94	88	73	68
Type of access--instructional level: 1/					
Elementary	2,195	82	79	73	78
Secondary	6,615	86	72	63	45
Combined 2/	677	84	90	75	33
More than one level	1,812	87	86	77	79
Enrollment size:					
Fewer than 2,500	4,703	84	71	61	42
2,500-9,999	2,284	86	75	67	46
10,000 or more	619	88	77	70	57
Region:					
North Atlantic	1,945	91	79	68	52
Great Lakes and Plains	3,185	84	74	66	44
Southeast	592	73	58	66	20
West and Southwest	1,884	82	67	55	46

1/ Figures contain duplicated counts because 1,812 or one-fourth of the districts provided computers at more than one instructional level, primarily at both elementary and secondary levels.
2/ Schools that contained both elementary and secondary grades, or special types, such as special or vocational education.

Number of Uses Per District

Most districts (82 percent) used their computers for more than one instructional purpose, as suggested by the relatively high proportions providing each of several types of applications. Data on the number of uses per district (chart 2) contribute an additional perspective on the role of computer-based education within districts and the differences among districts. 1/

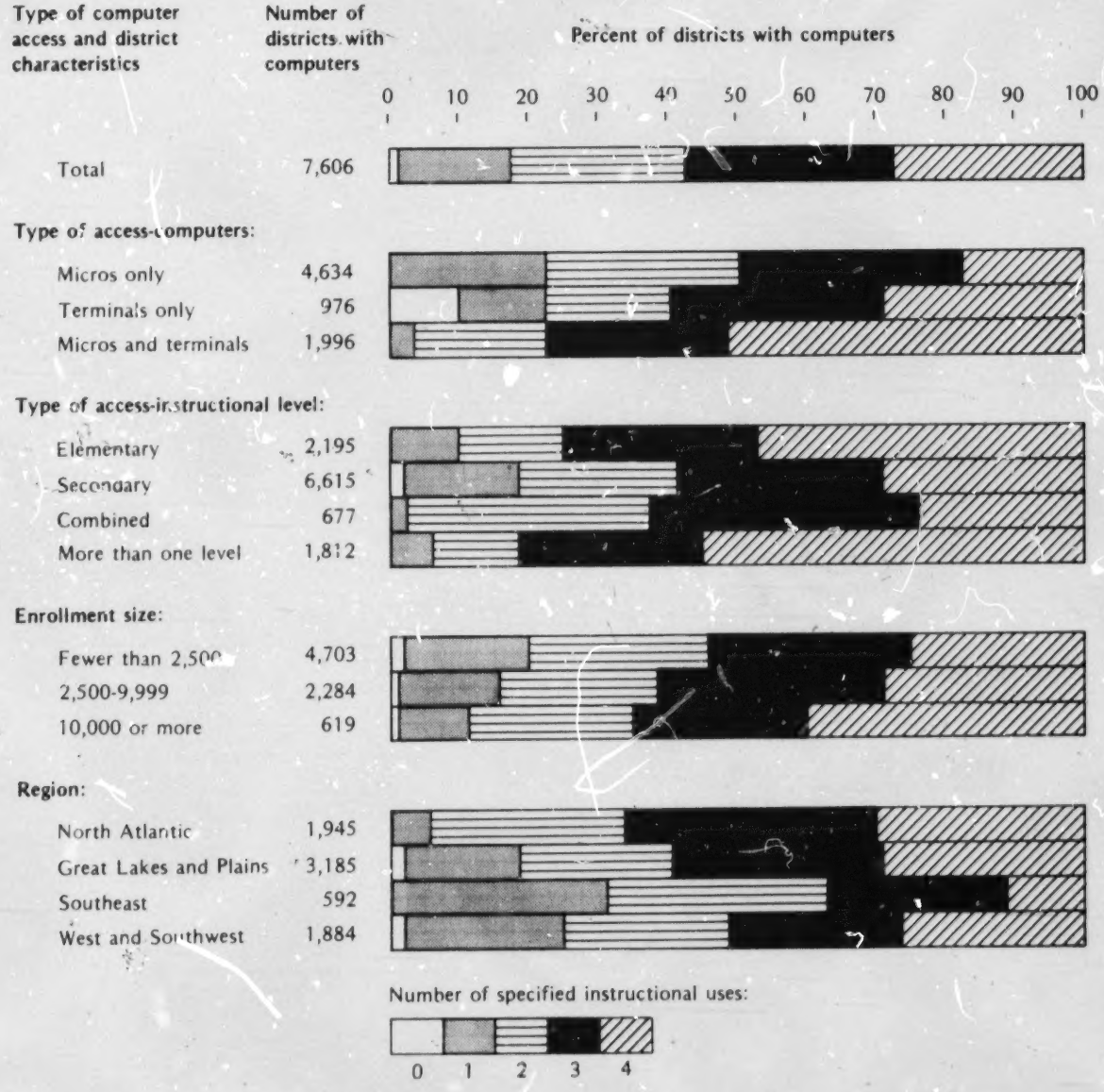
Districts with both microcomputers and terminals provided greater diversity of instructional uses than did those with only one type of computer. For example about one-half of the districts with both types of computers provided all four kinds of computer instruction, compared with 28 percent of the districts with terminals only and 17 percent of those with microcomputers only.

Larger districts tended to use computers for more purposes than did small districts. Two-fifths of the large districts provided all four kinds of computer instruction; the corresponding proportion of small districts was 25 percent.

Some differences in the number of uses occurred among geographic regions. For example, the North Atlantic had the smallest proportion of single-use districts, and the Southeast had the smallest proportion of districts using computers for all four purposes.

1/ Only the four specified uses are included--not the "other" uses volunteered by district respondents. A few districts with computer access did not use them for any of the four listed instructional purposes. These tended to be small districts, those with terminals only, those serving secondary schools, or districts located in the Southeast and West and Southwest regions. Many of these districts listed computer programming or career guidance as their only instructional applications.

Chart 2.--Number of instructional uses of computers per district, by type of computer access and selected district characteristics: United States, fall 1980



Districts With Computers for Instruction

Almost one-half (48 percent) of the Nation's school districts provided students with access to one or more computers for educational purposes in fall 1980 (chart 3). Of the districts that did not have computers, 18 percent planned to make them available to students within 3 years. At least 57 percent of all school districts are expected to provide students with some access to computers by fall 1983; this proportion could be larger, since one-third of the districts without computers were undecided about the future acquisition of computers.

Access provided by districts with computers varied by instructional level. Within districts, computer instruction was available primarily in secondary schools. An estimated 63 percent of districts with computers provided computer instruction at the secondary level only, compared with 5 percent that made computers available to students at the elementary level only, and 8 percent at the combined level only. About one-fourth of the districts provided access to computers at more than one level--generally at both the elementary and secondary levels.

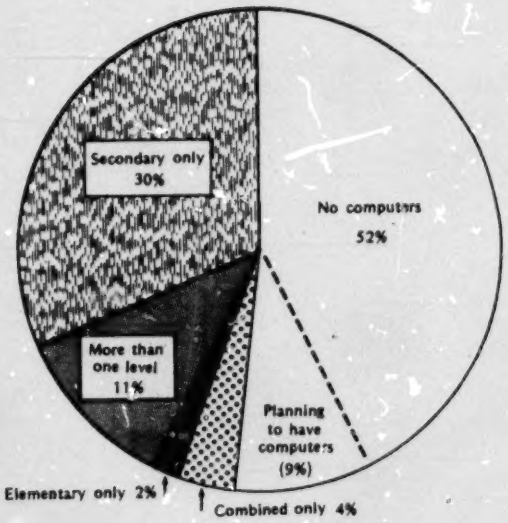
The majority of districts with computers (61 percent) provided microcomputers only, while 13 percent had terminals only. The remainder (26 percent) provided access to both microcomputers and terminals.

A total of 52,251 computers were located in the 7,606 districts with computers--an average of 6.9 computers per district. The averages varied considerably for districts with different types of computers. Districts that provided both microcomputers and terminals had the largest average number of computers per district (7.7 microcomputers and 7.5 terminals), while those with only microcomputers had the smallest average (3.3). Districts with only terminals averaged 6.6.

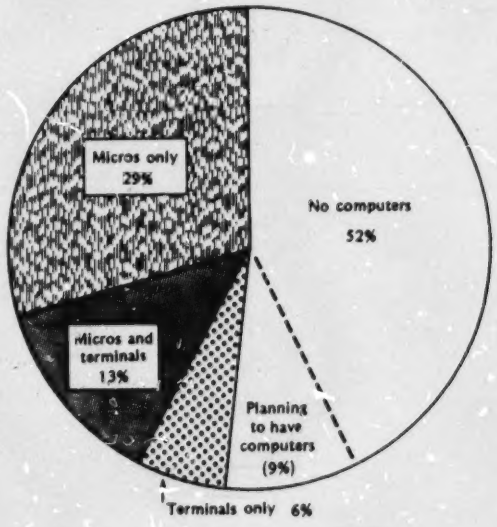
Averages, however, do not present the complete picture of computer availability. While some districts had many computers--as high as 455 microcomputers and 951 terminals--about 35 percent of the 7,606 districts with computers (or 17 percent of all districts) had only one computer, either a terminal or a microcomputer. Almost one-half (47 percent) of the districts with just microcomputers could provide access to only one, and 81 percent to fewer than five. Similarly, 49 percent of the districts with just terminals had only one available for students, while 68 percent had fewer than five for instructional purposes. Computer availability was somewhat greater in districts that provided access to both microcomputers and terminals. Only 6 percent had only one of each type of computer; still, almost three-fifths of these districts had fewer than five microcomputers and five terminals.

Chart 3.--Districts providing students with access to computers for instruction: United States, fall 1980

A. By instructional level
(N = 15,834 districts)



B. By type of computer
(N = 15,834 districts)



Note.- Percents may not sum to 100 because of rounding.

Student Access to Computers for Instruction

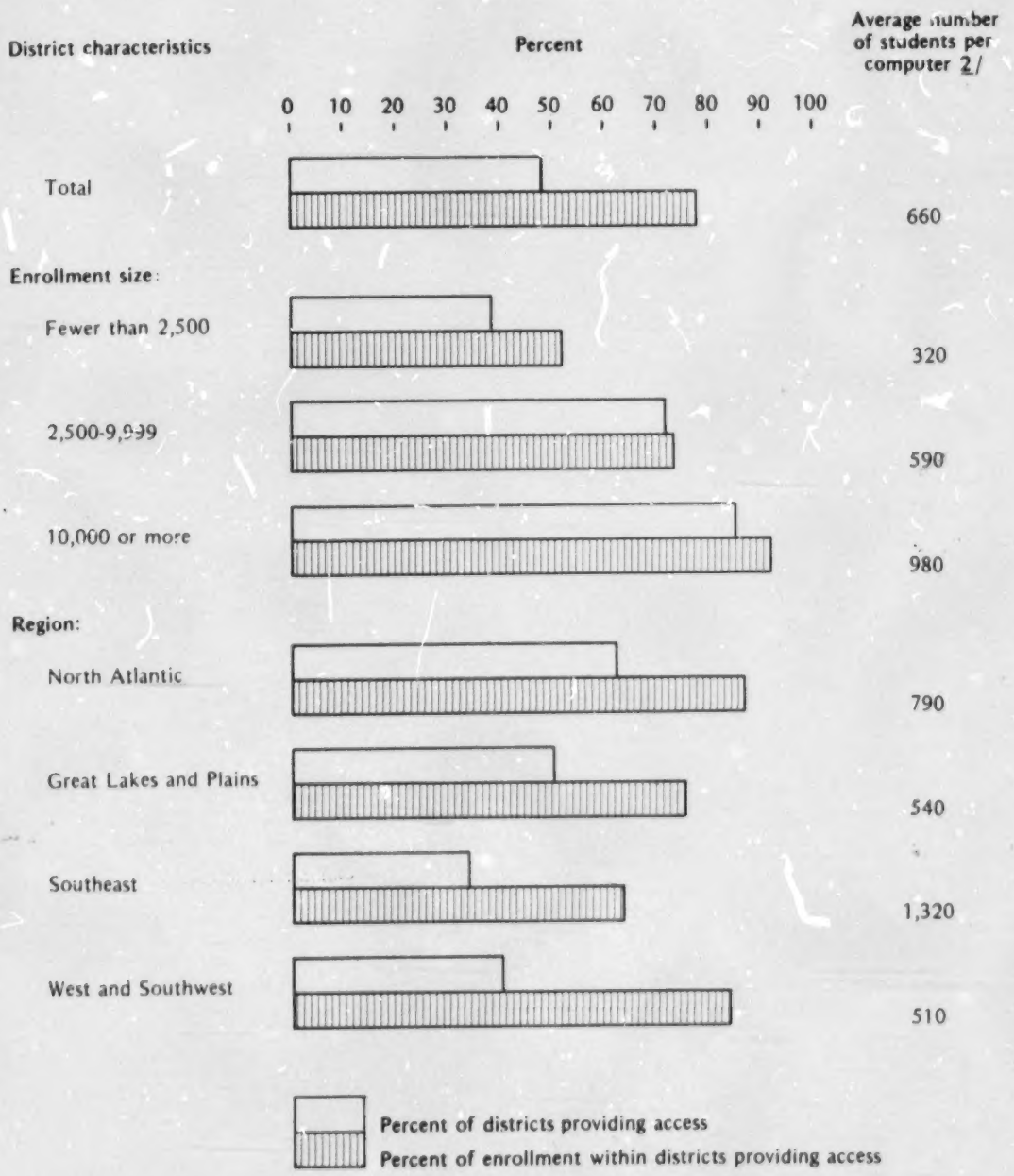
Computer availability also can be described in terms of the number of students per computer. Ascertaining the number of students actually using each computer, the most direct measure of student access, was beyond the scope of the survey. However, an approximate measure, based on the total enrollments in districts with computers and the numbers of computers, can be a useful indicator of student access.

About 78 percent of the Nation's public school students were enrolled in the 48 percent of the school districts with computers (chart 4). On the average, these districts had one computer for every 660 students.

Student access (i.e., the student-per-computer ratio) varied with district enrollment size. Both the proportion of districts with computers and the proportion of students enrolled in these districts increased with enrollment size. Within the small size category, 39 percent of the districts provided access to computers, and they enrolled about 52 percent of the students. In contrast, 86 percent of the large districts provided access and enrolled 92 percent of the students. Additionally, total enrollment in all districts varied greatly across the three size categories--from 8.9 million students in small districts to 20.6 million in large districts. However, not only the proportion of students enrolled in districts with computers, but the actual number of students increased substantially as enrollment size increased. Consequently, student access in districts with computers decreased as district enrollment size increased. In small districts, the estimated ratio of students to computers was 320 to 1, while in large districts, there were 980 students per computer.

Regional variations in student access occurred as well. In contrast to its distribution by district size, total enrollment was fairly uniform across the four regions (from 10.4 to 12 million students per region), while the number of computers varied considerably. Therefore, the lowest student-to-computer ratios were found in the regions with the largest numbers of computers (West and Southwest and Great Lakes and Plains), and the highest ratio occurred in the region with the smallest number of computers (Southeast).

Chart 4.--Percents of districts providing access to computers and of their total enrollment, and average number of students per computer 1/ in these districts, by selected district characteristics: United States, fall 1980



1/ Based on total enrollment. Enrollment data were included on the sample file. The source for these data was the NCES 1977-78 Universe of Local Public School Systems, ELSEGIS V, Part B2.
2/ Rounded to the nearest ten students.

Schools With Computers

An estimated total of 22,187 schools provided students with access to computers--about one-fourth of all public schools (table 3). These schools represent about one-half of all secondary schools in the Nation, 15 percent of all elementary schools, and 16 percent of the combined elementary-secondary, vocational, special education, and other special schools.

Although computer availability at the district level increased as enrollment size increased, the proportion of all schools with access to computers was relatively stable across enrollment size. In each of the three size categories, between 24 and 29 percent of the schools had computers.

Just as the percent of districts with computers increased with district size, their share of all schools also increased with district size. Small districts with computers accounted for 45 percent of all schools in that size category, while 91 percent of all schools in large districts were located in districts utilizing computers. However, small districts with computers spread computer-based instruction among their schools more widely than did large districts. In the small size category, districts providing access to computers served 64 percent of their schools with instructional computers, while large districts concentrated this resource in 26 percent of their schools.

Nationally, districts that had computers accounted for 70 percent of all schools, but provided access in only 37 percent of their schools. (The estimate of 26 percent of all schools that provided computer access is a product of these two percents.)

Regional differences in computer availability at the school level were smaller than the corresponding differences at the district level. Computers were available in 15 percent of the schools in the Southeast. In the other regions, between 27 and 30 percent of the schools provided access to computers.

Table 3.--Number of schools providing access to computers, by selected district characteristics: United States, fall 1980

District characteristics	All schools 1/	Districts providing access				
		All schools 1/		Only schools providing access		
		Total	Percent of column 1	Total	Percent of column 2	Percent of column 1
	(1)	(2)	(3)	(4)	(5)	(6)
Total.....	86,476	60,117	70	22,187	37	26
Enrollment size:						
Fewer than 2,500.....	29,187	13,166	45	8,468	64	29
2,500-9,999.....	27,614	20,007	72	6,656	33	24
10,000 or more.....	29,674	26,944	91	7,064	26	24
Region:						
North Atlantic.....	17,187	14,287	83	5,122	36	30
Great Lakes and Plains..	28,336	18,645	66	7,558	41	27
Southeast.....	18,178	10,725	59	2,800	26	15
West and Southwest.....	22,774	16,460	72	6,707	41	29

1/ Estimated from school data included on the sample file. The source for these data was the NCES 1977-78 Universe of Local Public School Systems, ELSEGIS V, Part B2.

Note.--Numbers may not sum to totals because of weighting.

Methods to Facilitate or Improve Computer Instruction

Several courses of action are available to districts to help facilitate or improve the use of computers for instruction. Respondents in districts that had computers or planned to acquire them indicated whether they were using or planning to use any of the following means for improving computer-based education:

- A group to select instructional computer programs and material
- A group to write instructional computer programs and material
- A resource support group to provide technical or instructional assistance
- In-service teacher training.

About one-half (53 percent) of the districts with computers and 11 percent of those planning to initiate computer-based instruction have designated a group to select computer programs and material (table 4). In addition, many districts planned to appoint such a group, resulting in a total of 71 percent of the 9,100 districts providing computer access or planning to provide access that either used or planned to use a group to select programs.

Perception of the importance of in-service training was equally widespread. About three-fourths of the districts with computers or planning to acquire them provided or planned to provide such training for their teachers.

The other two options were reported somewhat less frequently. About one-half of the districts either had or planned to establish a support group to provide technical or instructional assistance. A similar proportion either had or planned to appoint a group to write computer programs.

Generally, across district characteristics, groups to select computer programs were used more frequently than groups to write programs. Districts with both microcomputers and terminals were more likely to have groups designated to select programs: about seven of every ten districts with both types of computers, compared with less than half of the districts with microcomputers only or terminals only. Proportionally more large than small districts used each of the specified methods to improve computer instruction.

Table 4.--Methods to facilitate or improve computer instruction, by type of computer access and selected district characteristics: United States, fall 1980

Type of computer access and district characteristics	Number of districts 1/	Methods			
		Group to select programs	In-service teacher training	Technical support group	Group to write programs
		(In percents of column 1)			
Used or planned to use method:					
Total	9,100	71	75	50	47
With access	7,606	69	77	54	50
Planning access	1,494	76	66	29	32
Used method:					
Total	9,100	46	45	36	29
With access	7,606	53	53	43	34
Planning access	1,494	11	5	1	0
Used method (with access or planning access):					
Enrollment size:					
Fewer than 2,500	5,963	40	38	31	26
2,500-9,999	2,485	58	57	45	33
10,000 or more	653	63	59	54	38
Region:					
North Atlantic	2,302	53	53	39	35
Great Lakes and Plains	3,691	49	44	42	30
Southeast	730	35	40	35	19
West and Southwest	2,378	38	39	26	23
Used method (with access):					
Type of access--computers:					
Micros only	4,634	47	51	37	32
Terminals only	976	45	46	55	28
Micros and terminals	1,996	71	60	53	42
Type of access--instructional level: 2/					
Elementary	2,195	63	67	49	32
Secondary	6,615	54	52	44	35
Combined 3/	677	45	54	48	32
More than one level	1,812	66	67	53	36

1/ Includes districts providing access to computers and those planning to provide access.
2/ Figures contain duplicated counts because 1,812 or one-fourth of the districts provided computers at more than one instructional level, primarily at both elementary and secondary levels.
3/ Schools that contained both elementary and secondary grades, or special types, such as special or vocational education.

Note.--Numbers may not sum to totals because of weighting.

Critical Needs

All respondents indicated which of the following needs were critical to the initiation or expansion of computer-based instruction:

- Assistance in planning a program
- In-service teacher training
- A greater range of instructional computer programs and material
- Technical assistance services in support of program operations.

In addition, districts ranked their critical needs in order of importance.

Almost one-half of the 15,834 districts (47 percent) viewed teacher training as necessary, and 41 percent indicated a critical need for instructional computer programs (table 5). About one-third of the districts believed that assistance in planning a computer-based instructional program was urgently needed. A similar proportion identified as critical the need for technical assistance to support program operations. In addition, 32 percent mentioned an unlisted need--additional funding.

Teacher training, computer programs, and planning assistance were ranked as most important by about one-third of the districts citing them as critical needs. On the other hand, only one in every ten districts that perceived technical assistance to be a critical need believed that it was the primary need. A greater degree of unanimity was expressed by the districts that mentioned funding; about 92 percent of these districts rated this need as the most critical.

Districts that already provided computer instruction were more likely to perceive the needs for instructional computer programs (60 percent) and in-service training (56 percent) as critical, compared with districts that did not have computers (24 and 39 percent, respectively). However, districts that were planning to acquire computers rated teacher training as a critical need just as frequently as did those districts with computers.

In general, districts with both microcomputers and terminals were more likely to consider in-service training and technical assistance as critical needs, in contrast to districts with only one type of computer.

Computer programs and in-service training were rated as critical by proportionally more large than small districts. The largest difference occurred for computer programs; about three-fifths of the large districts indicated a need for a greater range of instructional material, compared with less than two-fifths of the small districts.

Perceptions of need varied by region as well. For example, districts in the Southeast were more likely to rate the need for planning assistance as critical than were districts in the other regions. Computer programs were perceived as a critical need more often by districts in the North Atlantic and Southeast regions than by districts in the Great Lakes and Plains and in the West and Southwest.

Table 5.--Critical needs for initiation or expansion of instructional use of computers, by type of computer access and selected district characteristics: United States, fall 1980

Type of computer access and district characteristics	Total number of districts	Critical needs				
		In-service training	Computer programs	Planning assistance	Technical assistance	Funds
Total	15,834	7,519	6,537	5,613	4,652	5,077
		(In percents of column 1)				
Total	15,834	47	41	35	29	32
No computer access	8,228	39	24	34	28	38
Planning access	1,494	58	37	38	28	33
Not planning access	6,734	35	21	33	28	39
With computer access	7,606	56	60	37	31	26
Micros only	4,634	53	64	36	26	27
Terminals only	976	54	48	34	24	26
Micros and terminals	1,996	65	60	40	46	24
Type of access--instructional level: 1/						
Elementary	2,195	73	73	42	40	23
Secondary	6,615	58	57	38	31	25
Combined 2/	677	38	82	16	21	25
More than one level	1,812	74	68	40	39	22
Enrollment size:						
Fewer than 2,500	11,946	45	37	34	26	32
2,500-9,999	3,171	56	53	39	39	35
10,000 or more	717	58	62	41	38	24
Region:						
North Atlantic	3,067	51	54	33	36	39
Great Lakes and Plains	6,315	47	37	32	25	28
Southeast	1,739	56	52	56	41	37
West and Southwest	4,713	42	34	34	26	32

1/ Figures contain duplicated counts because 1,812 or one-fourth of the districts provided computers at more than one instructional level, primarily at both elementary and secondary levels.
2/ Schools that contained both elementary and secondary grades, or special types, such as special or vocational education.

SUMMARY

The educational potential of interactive computers has long been recognized by districts utilizing terminals connected to remote central processors. The recent introduction of the affordable microcomputer, however, now has enlarged considerably the opportunity for computer-based instruction in the schools.

Survey data gathered at the end of 1980 revealed that approximately one-half of the Nation's districts provided computer-based education. While 39 percent of these 7,606 districts utilized the more traditional terminals, 87 percent had micro-computers. An estimated 61 percent had microcomputers only, compared to 13 percent with terminals only. About 26 percent provided access to both types of computers.

Constituting a majority of the estimated 52,251 computers available to students, microcomputers were distributed fairly evenly among small, medium-sized, and large districts. In contrast, terminals were located more frequently in medium-sized and large districts than in small ones. Computers were used in one of every four schools, across all grade levels, but were concentrated primarily at the secondary level. About three-fourths of the microcomputers, as well as of the terminals, were utilized in one of every two junior or senior high schools.

On the average, districts with computers had one for every 660 students in their districts. Approximately 35 percent of the districts had only one computer, either a microcomputer or terminal.

School districts used computers for a number of instructional purposes. The most frequent applications were introduction to computer concepts (i.e., computer literacy), learning enrichment in specific subject areas, and challenge for high achievers. The use of computers for remedial and compensatory instruction trailed in frequency, especially in secondary schools and in districts with microcomputers only.

The expanded application of computer technology has created new requirements for its optimal deployment in the schools. Foremost among these needs were teacher preparation through in-service training and the increased availability of a wide range of quality computer software for instructional purposes (courseware). Numerous districts volunteered the information that funds were a limiting factor affecting the start or expansion of computer-based instruction.

Many districts were taking steps to facilitate their computer-based education programs. About half of the districts with computers were conducting some form of in-service teacher training program. A comparable number had designated a group to select existing courseware products. An additional 20 percent of the districts planned to take each of these actions. Of the approximately 1,500 districts planning to acquire computers, about 70 percent had initiated or planned to initiate in-service training and courseware selection.

The future no doubt will bring significant changes in the character and quality of computer hardware and courseware. The findings in this report reflect an early stage in the planning and utilization of this technology by the schools to improve teaching and learning.

APPENDIX I

The Fast Response Survey System

The Fast Response Survey System (FRSS) was established by NCES so that education data, urgently needed for planning and policy formulation, could be collected quickly and with minimum burden on respondents.

The FRSS covers six education sectors:

State education agencies (SEA's)

Local education agencies (LEA's)

Public elementary and secondary schools

Nonpublic elementary and secondary schools

Institutions of higher education

Noncollegiate postsecondary schools with occupational programs

All 50 States and the District of Columbia are included in the SEA sector. For each of the other sectors, a stratified random sample was designed to allow valid national estimates to be made. The sample sizes range from 500 to 1,000.

A data-collection network involving both respondents and coordinators was developed in each sector. Coordinators assist in the data collection by maintaining liaison with the sampled institutions or agencies. The respondents, selected to report for their institutions or agencies, voluntarily provide the policy-oriented data requested in the questionnaires.

The Fast Response Survey System provides NCES with a mechanism for furnishing data quickly and efficiently. All aspects of the system--the sample design, the network of coordinators and respondents, and the short questionnaires--have been designed with this end in mind.

Methodology for the Survey of LEA's on the Interactive Use of Computers for Instruction

The national sample of 636 local education agencies used for this survey was drawn with probability proportional to the square root of size from the universe of 15,834 public school districts in the United States. The universe of LEA's was stratified by district enrollment size and sorted by geographic region prior to sample selection.

After adjusting for school district closings and refusals to participate in the Past Response Survey System, the number of potential respondents was reduced to 579. Questionnaires were mailed to these respondents in October 1980. Data collection continued until a 97 percent response (563 questionnaires) was obtained.

The response data were weighted to produce national estimates, and a weight adjustment was made to account for survey nonresponse. The weights were calculated for each cell of a two-way tabulation of enrollment size and geographic region. Table A shows the cell and marginal totals used in the weighting.

Enrollment and school data were estimated from background information on the sample file. The source of these data was the NCES 1977-78 Universe of Local Public School Systems. A single exception occurred for total numbers of elementary, secondary, and combined or special schools in the Nation. These are unpublished data from Statistics of Public Elementary and Secondary Day Schools, Fall 1980, NCES.

Table A.--Universe of public school districts, by enrollment size and region

Enrollment size	Total	Region			
		North Atlantic	Great Lakes and Plains	South-east	West and Southwest
Total.....	15,834	3,067	6,315	1,739	4,713
Fewer than 2,500...	11,946	1,990	5,262	833	3,861
2,500-4,999.....	2,067	630	635	427	375
5,000-9,999.....	1,104	306	271	293	234
10,000-24,999.....	530	121	113	120	176
25,000-149,999.....	178	17	32	65	64
150,000 or more....	9	3	2	1	3

Source: NCES 1977-78 Universe of Local Public School Systems, ELSEGIS V, Part B2.

Standard Errors of the Statistics

The findings presented in this report are estimates based on the FRSS school district sample and, consequently, are subject to sampling variability. If the questionnaire had been sent to a different sample, the responses would not have been identical; some figures might have been higher, while others might have been lower. The standard error of a statistic (an estimate of the sampling variation of the statistic) is used to estimate the precision of that statistic obtained in a particular sample. If all possible samples were surveyed under similar conditions, intervals of 1.645 standard errors below to 1.645 standard errors above a particular statistic would include the average result of these samples in 90 percent of the cases. An interval computed in this way is called a 90 percent confidence interval.

Table B presents coefficients of variation for selected questionnaire items. The coefficient of variation, a measure of relative error, is obtained by dividing the standard error of the estimate by the estimate. For example, an estimated 7,606 districts provided students with access to computers in fall 1980; the coefficient of variation for this estimate is .044. The standard error is 335 (7,606 times .044), and the 90 percent confidence interval is 7,606 $\pm$ 551 (7,606 $\pm$ 1.645 times 335). Therefore, in at least 90 percent of all possible samples, between 7,055 and 8,157 districts would have indicated that they had computers for student use.

Specific statements of comparison in the text are significant at least at the 80 percent confidence level. However, confidence levels are generally higher for estimates based on larger proportions of the total sample. For example, the confidence level is about 95 percent for the comparison between the percents of districts with computers that offer computer literacy (6,434) and those that offer learning enrichment (5,509). Coefficients of variation for items in the questionnaire and statistics presented in this report, not included in table B, can be obtained on request.

Table B.--Coefficients of variation for selected items

Item	Estimate	c.v.
Number of computers	52,251	.073
Number of microcomputers	30,715	.083
Number of terminals	21,536	.145
Number of districts with computers	7,606	.044
Number of districts with micros only	4,634	.064
Number of districts with terminals only	976	.140
Number of districts with micros and terminals	1,996	.082
Number of schools in the Nation	86,473	.023
Number of schools in districts providing computer access	60,117	.038
Number of schools with computers	22,187	.072
Number of students in all districts	44,342,253	.049
Number of students in districts with computers	34,429,515	.071
Average number of students per computer	659	.075
Number of districts using computers for:		
Computer literacy	6,434	.048
Ranking it as "1", primary use	3,921	.085
Learning enrichment	5,509	.053
Ranking it as "1", primary use	1,464	.158
Challenge for high achievers	4,843	.055
Ranking it as "1", primary use	846	.259
Remedial and compensatory instruction	3,397	.086
Ranking it as "1", primary use	1,110	.121
Number of districts using the following methods to facilitate or improve computer-based instruction:		
A group to select computer programs	4,199	.059
In-service teacher training	4,085	.086
Technical support group	3,316	.083
A group to write computer programs	2,603	.105
Number of districts indicating the following needs as critical:		
In-service teacher training	7,519	.059
Greater range of instructional computer programs	6,537	.060
Assistance in planning a program	5,613	.063
Technical assistance to support program operations	4,652	.083
Funds	5,077	.081

APPENDIX II
REPRODUCTION OF SURVEY QUESTIONNAIRE

FAST RESPONSE SURVEY SYSTEM

U.S. DEPARTMENT OF EDUCATION
NATIONAL CENTER FOR EDUCATION STATISTICS
WASHINGTON, D.C. 20202

Form approved
FEDAC No.
App. Exp.

SURVEY OF LEA'S ON THE INTERACTIVE USE OF COMPUTERS FOR INSTRUCTION

This report is authorized by law (20 U.S.C. 1221e-1). While you are not required to respond, your cooperation is needed to make the results of this survey comprehensive, accurate, and timely.

Definition for purposes of this survey

- Computers: Terminals (connected to a central processor) or microcomputers used interactively by students for instructional or learning purposes. Some of these uses are tutorial, drill and practice, simulation, and computer literacy/programming. Excluded are the use of computers for computer-managed-instruction that is not also student interactive and the use for vocational data processing courses. A microcomputer is defined to include at least a TV-like screen for display, a typewriter keyboard, logic and internal memory, some means of secondary storage for programs, and to cost up to about $5,000.

1A. Estimate the number of each type of computer available currently (fall 1980) for interactive access to students in your district for instructional/learning purposes. If none, enter zero.

Microcomputers_____ Terminals_____

B. If no interactive computer access is currently available to students, does your district plan to make such computer access available within the next 3 years?

Yes_____ *Skip to Q.4* No_____ *Skip to Q.5* Don't know_____ *Skip to Q.5*

2. In Part A below, estimate the number of each of the following types of schools currently making interactive computer access available to students. If none, enter zero. If your district does not contain a type of school, enter N.A.

In Part B below, estimate the number of microcomputers and terminals currently available for interactive access to students in each type of school. If none, enter zero. If a computer is shared across types of schools, include it in each type of school in which it is available.

Part A. Number of schools making interactive computer access available to students	Type of school by grade level (According to your district's definition)	Part B. Number of available computers	
		Microcomputers	Terminals
	Elementary		
	Secondary (including middle/ junior high)		
	Combined elementary/ secondary or special types		

3. In Part A below, check each current use of computers by students in your district. Rank each checked use in order of the proportion of computer usage, with "1" indicating the highest proportion of total computer-time use.

If your district is considering or planning or prefers a change in the priorities of computer use (as given in the rank assignments in Part A), rank the prospective priorities in Part B below, with "1" indicating the highest priority of use.

Use of computers	Part A. Current use		Part B. Prospective priority
	Check if used	Rank proportion of use	Rank (if different from Part A ranks)
A. Remedial and compensatory (e.g., drill and practice)			
B. Introduction to computer concepts (computer literacy)			
C. Learning enrichment in specific subject areas			
D. Challenge use for high achievers (e.g., computer clubs, special classes)			
E. Other (specify)			

4. Which of the following methods of facilitating/improving computer instruction is your district currently using or planning? Check the appropriate column for each method that your district is using or planning to use.

Methods for facilitating/improving computer instruction	Using	Not using, but plan to start
A. A group designated to select instructional computer programs/material		
B. A group designated to write instructional computer programs/material		
C. A resource support group to provide operational (technical or instructional) assistance		
D. In-service teacher training		

5. Check each of the operational and/or planning needs that is critical to the initiation or expansion of the instructional use of computers in your district. Rank the checked needs, with "1" indicating the most critical need.

Need	Check if critical	Rank
A. Assistance in planning program		
B. In-service teacher training		
C. Greater range of instructional computer programs/material		
D. Technical assistance services in support of program operations		
E. Other (specify)		

Respondent: Name_____

Phone (include area code)_____

Title_____ State_____ Date_____

ED (NCES) 2379-12, 10/80